PESTICIDE CONTAINER DISPOSAL

SITE ASSESSMENT PROJECT

REPORT SUMMARY

Land Protection Branch

July 6,1987.

Perception of Pesticide Container Disposal Program (PCDP) sites as potential sources of contamination coupled with increased public awareness of chemical related hazards and their environmental consequences prompted the Department to conduct the Pesticide Container Disposal Site Assessment Project in 1986. The overall objective of the project was to determine if the current operational practices, physical characteristics and location of selected PCDP sites were and would continue to be safe with respect to the environment. In order to achieve this objective the following specific activities were undertaken.

1. As a preliminary step, specific information for each site was evaluated to determine if there was any potential public health or environmental contamination problems;

2. Field inspections and studies at selected sites were conducted to; a) determine the actual extent of contamination at PCDP sites caused by the ongoing storage and handling of the containers, and; b) determine how effectively the operational practices, physical characteristics and site locations had actually reduced the effects or slowed the movement of pesticide residues.

3. As a result of these investigations it was then possible to redefine the guidelines for the establishment of new PCDP sites and to make recommendations to ensure the greatest possible environmental protection at existing sites.

A total of 78 PCDP sites were investigated and the summary of the investigation results are provided as follows:

OPERATIONAL STATUS

Inspection results showed that 37% (29 sites) of the sites studied were in good condition. These sites were properly established and well maintained.

Approximately 56% (44 sites) were found to be in fair condition. These sites were properly established but were not properly maintained or experienced operational problems such as improperly stacked metal containers, plastic containers mixed with the metal ones, burning of containers at the site or poor fence condition.

Only 6% (5) of the sites inspected were found to be in poor condition. They were not properly established, maintained or operated. Common observations at these sites included: indiscriminate placement of both metal and plastic containers, the existence of industrial chemical containers, burning of plastic containers, an abundance of cardboard boxes and poor fence condition.

Soil staining caused by spillage of pesticide residues was present to a minor degree, less than 15% of the surface area, at 80% of the sites visited.

The extent of soil contamination seemed to be related to site maintenance and operational procedures and had no relationship to the age of the facility or the number of containers handled.

Accessibility for 90% of the sites inspected was rated as good.

SITE SUITABILITY AND INTEGRITY

PROXIMITY TO RESIDENCES

The proximity of PCDP sites to residences was examined because of the potential health effects of air emissions from the containers while in storage. Approximately 90% of the sites studied had an isolation distance of 500 metres or more. One site was found to be within 100 metres of a residence while the remainder of the sites were located between 100 and 499 metres from dwellings.

The suggested isolation distance of 500 metres was also re-examined with the knowledge of the average volume and concentration of residues at a site using computer modeling techniques. The computer calculations showed that the present 500 metre recommended isolation distance was generally acceptable.

PROXIMITY TO WATER BODIES

The proximity of PCDP sites to surface water bodies as well as the direction of external site drainage were examined because of the potential for transport of contaminants by runoff water. Approximately 78% of the sites studied posed no threat to water bodies in the area or no water bodies existed within 1.5 km. of the site. The remainder of the sites studied were established at locations where runoff may enter intermittent water bodies or sloughs under normal conditions or major water bodies under extreme conditions.

SOIL AND GROUNDWATER

The soil and subsoil characteristics of the PCDP sites were examined because of their importance in protecting groundwater by both limiting the downward movement and reducing the effectiveness (attenuation) of the pesticide residues. Fine and medium textured undisturbed soils (heavy clay to loam) are preferred as a base for PCDP sites since these type of soils slow the downward movement of contaminants.

Shallow 60 cm. (2 ft.) excavations at the PCDP sites showed that 38% of the sites examined were situated on previously disturbed soils, mostly those sites located in conjunction with municipal waste disposal grounds. In total, the preferred heavy clay to loam soils were found at 69% of the sites. The remaining 31% of the sites were situated upon course textured (sandy) soils. These remaining sites are considered as being situated upon less than optimal soils for the protection of groundwater.

A system for determining the moisture retention capacity of soil was proposed and examined as a possible PCDP site selection criteria. The system incorporated the factors of soil texture, organic matter content and bulk density as well as establishing minimum values for the various soil types in the province. This criterion was primarily intended to be used by the department when considering any particular location as a proposed PCDP site.

The moisture content of the upper 10 cm soil layer at PCDP sites was also determined during field studies. The moisture determinations would suggest that some capacity for liquid retention in the uppermost layer generally existed over the summer

period when container collection site use was the highest. These findings would also indicate that small volume spills to soils with moisture values below field capacity are likely to be initially retained in the upper horizons (layers) where the active ingredients of the pesticide residues will undergo the natural degradation process.

The available records of well data were reviewed to determine the approximate depth to ground water underlying PCDP sites. A review of the information showed that 14% of the sites studied exhibited optimal subsoil characteristics typified by consistent clay or till layers or water tables in excess of 30 metres (100 ft) in depth. Approximately 22% of the sites were typified by course underlying layers of parent material or water tables of less than 6 metres (20 ft).

EXTENT AND FATE OF ON-SITE CONTAMINANTS

PCDP sites were monitored to determine the extent of pesticide contamination and the possible fate of these contaminants. Composite soil samples from the upper 15 cm were obtained from 33 of the 78 sites visited. Analyses were preformed for seven of the most commonly used pesticides including 2,4-D, Bromoxynil, Triallate, Trifluralin, Diclofop-methyl, Dimethoate and Chlorpyrifos.

Analytical results would suggest that no contamination, i.e. less than 0.01 ppm (parts per million), was occurring at three of the studied sites which were recently established (less than 1 year) and well maintained. Analytical results for most sites , which had undergone crushing operations over a time period of 16

to 403 days prior to sampling, indicated soil contamination within the ranges of less than 100 ppm and less than 10 ppm for 94% and 85% respectively of the 231 analyses performed. These results would suggest that spillage due to prolonged storage or crushing operations has occurred at some of the PCDP sites. However, visual traces of chemical spills did not extend below 15 cm (6 inches) in the soil at any of the sites which were examined. Pesticide concentrations immediately below the container storage area indicated that the residue losses from properly stacked containers are minimal.

The significance of on-site contamination was assessed by comparison to the potential pesticide levels in agricultural soils resulting from common cultivation practices. The soil pesticide concentrations in small areas within the studied PCDP sites exceeded the calculated potential agricultural levels at some of the locations monitored. It should be noted however, that the majority of the sites which were sampled were those which exhibited the greatest chemical staining and may therefore be most representative of the worst case scenario.

CONCLUSIONS

This project sought to determine and assess the suitability of the physical characteristics and locations of Pesticide Container Disposal Program sites and the acceptability of their operational practices with respect to the preservation of the quality of the environment. Conclusions reached from this study provide answers to address the perceived as well as real impacts of the PCD Program.

Generally, losses of pesticides at PCDP sites resulting from the storage and crushing operations pose a minimal risk to the local environment and public safety provided that proper site establishment and operational controls are employed by the municipality.

The study shows that the physical characteristics of properly located sites reduce the effects of the pesticide residues and impede their movement.

The present guidelines provide for the satisfactory establishment and operation of the Pesticide Container Disposal Program collection sites. However, more special attention should be focused on isolation distance, soil and subsoil characteristics and to various other requirements of the program operation.

RECOMMENDATIONS

OPERATIONAL PRACTICES

In order to ensure continuing environmental protection at PCDP sites attention to the following operational practices is recommended.

(a) Segregation of PCDP sites into fenced and placarded areas for metal and plastic container storage should be undertaken if not already present.

(b) Municipal maintenance personnel should ensure that proper metal container stacking is initiated at the outset of the year and continued thereafter.

(c) Signs requiring triple rinsing of containers prior to their placement should be erected at each site.

(d) Burning of plastic containers at PCDP sites is not recommended.

(e) Cardboard shipping boxes should be removed to municipal landfill sites.

(f) The ability of the crusher and shredder to perforate containers and recover residues must be maximized at all times.

(g) If possible municipal authorities and the crushing/shredding contractors should rotate the areas of container storage and processing within the collection site each year.

(h) In order to remedy situations where misuse of the PCD Program or its sites has occurred and is continuing, sponsorship of the support services by Saskatchewan Environment and Public

Safety should be contingent upon adequate site maintenance and satisfactory compliance with the site establishment requirements.

(i) Each site must be visited once per year by the contractors responsible for the crushing and removal of the containers. Consideration should be given to tendering these services on the basis of contract areas if this schedule cannot be adhered to.

SITE ESTABLISHMENT CRITERIA

The following are recommended as revised site establishment criteria for the Pesticide Container Disposal Program.

A. Location and Topography

PCDP sites should be established within areas typified by flat, gently undulating or mixed to gently rolling topography which drain to adjacent croplands or buffer strips. Steep slopes which would enhance surface runoff or spring runoff water courses must be avoided. High ground is recommended and runoff waters originating from a PCDP site must not be permitted to enter water supply reservoirs, water courses or dugouts. Wet or flood prone areas should be avoided. In the event that the site is to be located in association with an existing waste disposal grounds, it should be situated between the entrance and the current disposal area.

B. Isolation Distances

PCDP sites should not be located within 500 metres of a residence. PCDP sites located in conjunction with a supervised waste disposal grounds should be situated at a lower grade and at least 50 metres downwind, from the direction of the prevailing

wind, of shelters or work places. PCDP sites should not be located within 500 metres of major water bodies.

C. Soil and Subsoil Characteristics

Course textured soils containing more than 75% sand (sand, loamy sands and sandy loams) should be avoided as base soils for PCDP sites. Undisturbed grassland or forest soils with a predominance of clay minerals are preferred as bases for PCDP sites.

Below the surficial soils of PCDP sites, locations with deep aquifers and predominantly fine and medium textured (heavy clays or glacial tills) overlying layers of parent materials are preferred. Known or suspected ground water recharge areas must be avoided. The present and future uses for the ground water must also be considered prior to site establishment.

D. Physical Requirements

Access: The site should be close to a main road. The area between the main access road and the site itself should be fairly level to provide reasonable access by farmers and the contractor. There should also be sufficient room for the contractor to work.

Fencing: The site should be fenced on at least 3 sides. If all 4 sides are fenced, a gate wide enough to accommodate access by a semi-trailer should be provided. The site should be segregated into fenced and placarded areas for separate metal and plastic container storage.

Site Area: The site area required is dependant upon the amount of pesticides used within the rural municipality. The size

of the site will therefore vary, however the minimum recommended area would be 2000 square feet. A site of this size would allow for both storage of the containers and access by the contractors responsible for the processing and removal of the containers.